Changes in the concept of genotype x environment interactions to fit agriculture evolution: multidisciplinary points of view.

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The homogenization of environments (E) encouraged by modern society and by the productivist model of agriculture has resulted in the homogeneity of genotypes (G) thereby reducing GxE interaction to a parasitic source of inaccuracy (a residual).
As this model is called into question and new societal values are affirmed, agriculture is diversifying to fit contrasted environments and may be represented by four models defined by two axes, one socio economic (individual logics vs. collective governance), and the other agro-ecological (analytical vs. systemic approaches). Models differ by (i) the objectives (from yield improvement to farmers empowerment), (ii) specific expectations concerning genotypes (from inherited genetic resources to varieties that represent genetic, ethical and social progress), (iii) a specific representation of the environment (from E, a simple interaction between the agro-ecological environment (M) and cultivation system (C), to E including a range of socio-economic components (Actors competences (A), Outlets (O), Legislation (L), , Society (S)) and (iv) particular relations between G and E (from GxE to GxMxCxA under evolving constraints represented by LxOxS).
Taking these diverse objectives into account has changed the way plant improvement is envisaged. Thus depending on the model concerned, the order, interest and status of the five classic stages of plant improvement (setting objectives, creating variability, selecting, evaluating and disseminating) may be called into question. Between the existing analytical model and a holistic model that remains to be developed, lies the challenge of ensuring the sustainability, efficiency and acceptability of plant breeding and resulting innovations. From a simple « noticing » that we attempt to reduce the GxE interaction has become an « objective » that we try to predict and valorize. Structuring the different components of E, G and GxE, enables us to extend the basic concept of representativeness both of the cultivation conditions and of the socio-economic « positions » of the involved actors.